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LISTS OF SPECIES

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Flora and vegetation of Pulau Babi Tengah, Johor, Peninsular Malaysia

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Abstract: Pulau Babi Tengah is a small granitic island, ca. 106 ha, lying off the south-east coast of Peninsular Malaysia. Except for plantation of coconut trees in the early 1900s and deforestation by refugees during the Vietnamese civil war, 1975–1981, the island has not been affected by human development and very few species have been introduced. Recently, a tourist resort has opened in the south and has initiated activities for the conservation of biodiversity. As part of that commitment, an exhaustive inventory of all terrestrial vascular plants has been done. The flora contains 312 taxa with 252 genera and 101 families. Several rare species, known only from this group of islands in Peninsular Malaysia, are recorded, as well as four Peninsular Malaysian endemic species. The most striking characteristic of Pulau Babi Tengah is the rarity of the exotic element, which is restricted to the anthropic areas.

Key words: Coastal, conservation, invasive species, island

INTRODUCTION

Ecosystems are generally difficult to delimitate physically and therefore they are difficult to conceptualize and understand in detail (Oldeman 1990). For this reason, islands have often been considered and used as models for understanding evolution processes (Leigh et al. 2007; Whittaker et al. 2008). Isolated islands constitute important centers of endemism (Kier et al. 2009) and they can provide stable refuges for species which originated from mainland areas (Cronk 1997). Unfortunately, tropical islands have most often been heavily impacted by human development and their biodiversity is threatened (Denslow 2003). Nevertheless, some islands lying off the south-east coast of Peninsular Malaysia, mainly Pulau Tioman, combine many remarkable features, i.e. being within a high biodiversity area, with perhumid climate, and still relatively unaffected by human development.

In this paper, we provide the first exhaustive inventory of the terrestrial vascular plant species occurring on one of the smaller islets of the Pulau Tioman group, i.e. Pulau Babi Tengah. This island has been mostly preserved from human influence and is now partly privately-owned and developed as an eco-responsible tourist resort, Batu Batu, which requested the current study. We discuss the most striking biodiversity features of the island in order to help the resort establish conservation priorities and sustainable development.

MATERIALS AND METHODS

Study area

Pulau Babi Tengah, 02°46′08″ N, 103°57′39″ E, is one of the many granitic islands lying off the southeast coast of Peninsular Malaysia. It has a round shape (ca. 1.3 km across, 106 ha) with hilly topography (reaching about 90–100 m of elevation) and is closely flanked by two islets: Pulau Babi Besar (on the southeast) which has a permanent local population, and Pulau Babi Hujung (on the northwest) which is uninhabitated (Figure 1). The largest and most intensively collected island in this region is Pulau Tioman (13,360 ha, highest peak at 1,038 m elevation), which is made of ca. 74 million years old granite (Lee et al. 1977). These islands belong to the "Peninsular Malaysian lowland rainforests" ecoregion (Olson et al. 2001; Olson and Dinerstein 2002; WWF 2011), which includes the lowland moist forests of Peninsular Malaysia and the extreme southern part of Thailand. This ecoregion presents floristic affinities mostly towards south-east, with Borneo and Sumatra, forming the "ever-wet Sundaland floristic group" (Van Welzen et al. 2011). Nevertheless, the subdivision of the Malesian region into biogeographical sub-regions has been extensively discussed in the literature and the results depend not only on knowledge improvement but also on the taxonomic groups considered (e.g., mosses, ferns, other plants, birds,

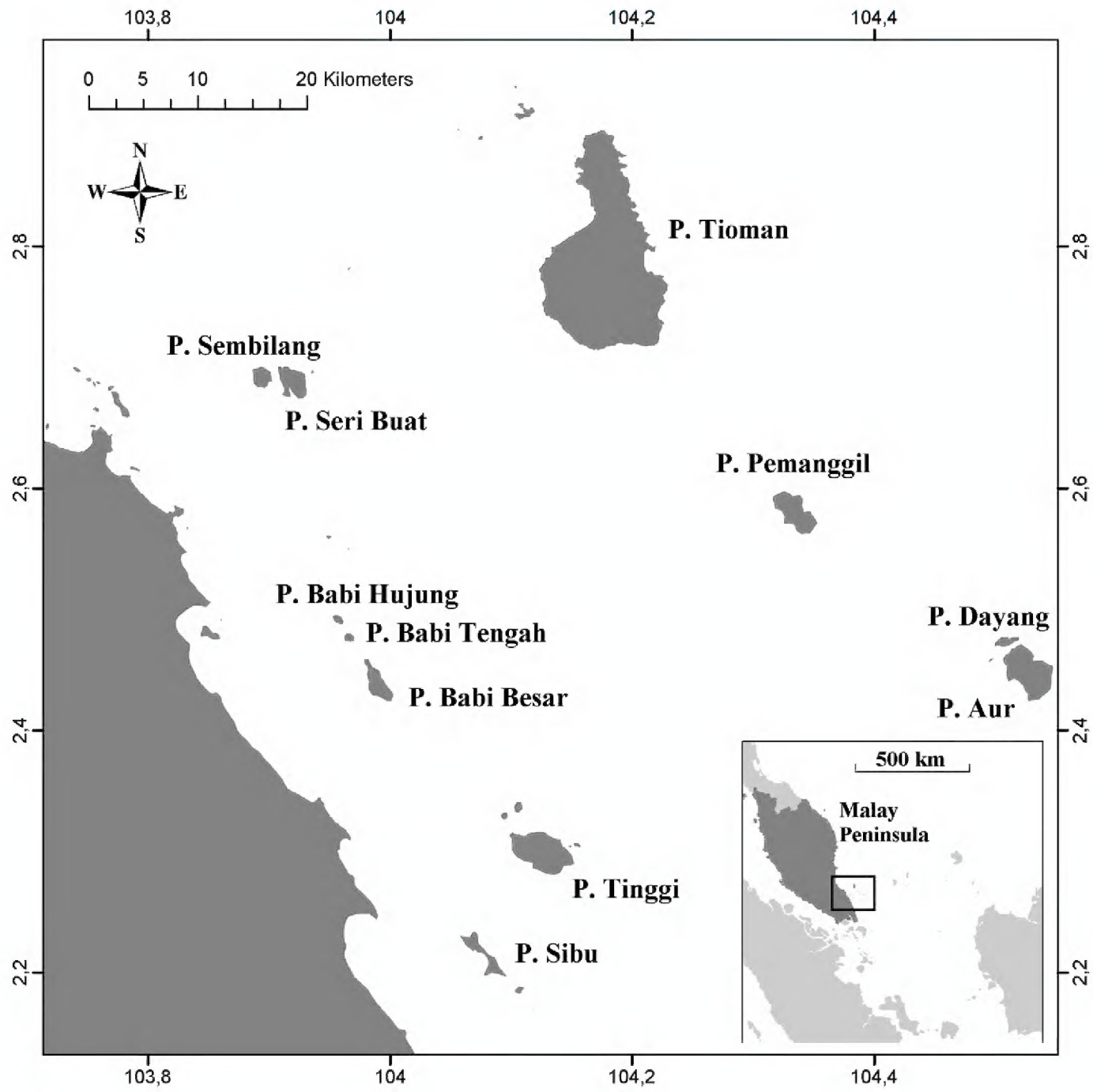

Figure 1. Map showing the position of Pulau Babi Tengah off the south-eastern coast of Peninsular Malaysia (Projection system: GCS WGS 1984, coordinates in decimal degrees).

etc.). In addition, floristic affinities observed for a given taxonomic group will show different patterns depending on the types of habitat considered (e.g., lowland vs. montane vegetation, coastal fringe, etc.). More widely, the Malesian region is generally considered as being part of the Indo-Malayan realm (Olson and Dinerstein 2002).

Based on the Köppen climate zone system (Kottek et al. 2006), Peninsular Malaysia belongs to the tropical wet climate zone, which means that rainfall is plentiful year-round without any marked dry season (WWF 2011). Nevertheless, two monsoons punctuate the region. From October to March a northeastern monsoon exposes the windward slopes of the east coast islands to strong winds which result in wind-pruned coastal vegetation (Saw 2010).

The typology of vegetation in South-East Asia and particularly in Peninsular Malaysia has been discussed recently for the publication of the Flora of Peninsular Malaysia (Saw 2010), based on the main historical studies published for that region (Symington 1943; Wyatt-Smith 1963; Webb et al. 1967; Whitmore 1984). The main diagnostic factors determining vegetation types in Peninsular Malaysia are climate (dryer in the north, near the Thai border, with semi-evergreen rain forests), elevation (lowland, lower montane, upper montane: Van Steenis 1935; Senterre 2012), soil drainage (swamps and marshes), proximity with the ocean (mangroves and coastal fringes) and the types of substrates (azonal edaphic variants on limestone, quartzite rocks, and on podzolized sands).

The seed plant flora of Peninsular Malaysia is estimated to include about 7,834 species (5,718 dicotyledons, 2,087 monocotyledons and 29 gymnosperms) with 1564 genera and 220 families (Kiew et al. 2010a), of which 12.9% are endemic (Van Welzen et al. 2011). The ferns and lycophytes of Peninsular Malaysia represent about 650 species for 137 genera and 40 families (Parris et al. 2010). Islands off the south-east coast of Peninsular Malaysia are characterised by the presence of species which are rare or absent from the mainland (Corner 1985; Turner et al. 1993; Turner 1995). Several floristic accounts of Pulau Tioman record a substantial list of rare plants, with at least 388 taxa of trees, 653 taxa of shrubs, eight hyper-endemic species and others that have a disjunct distribution skipping mainland Peninsular Malaysia and instead having Thai-Burmese or Bornean affinities (Henderson 1930; Lee et al. 1977; Latiff et al. 1999; Phang et al. 2008; Chew et al. 2013). Botanical explorations have been done mostly on the larger islands, e.g., Pulau Tioman, Pulau Aur (Henderson 1930; Turner et al. 1998),

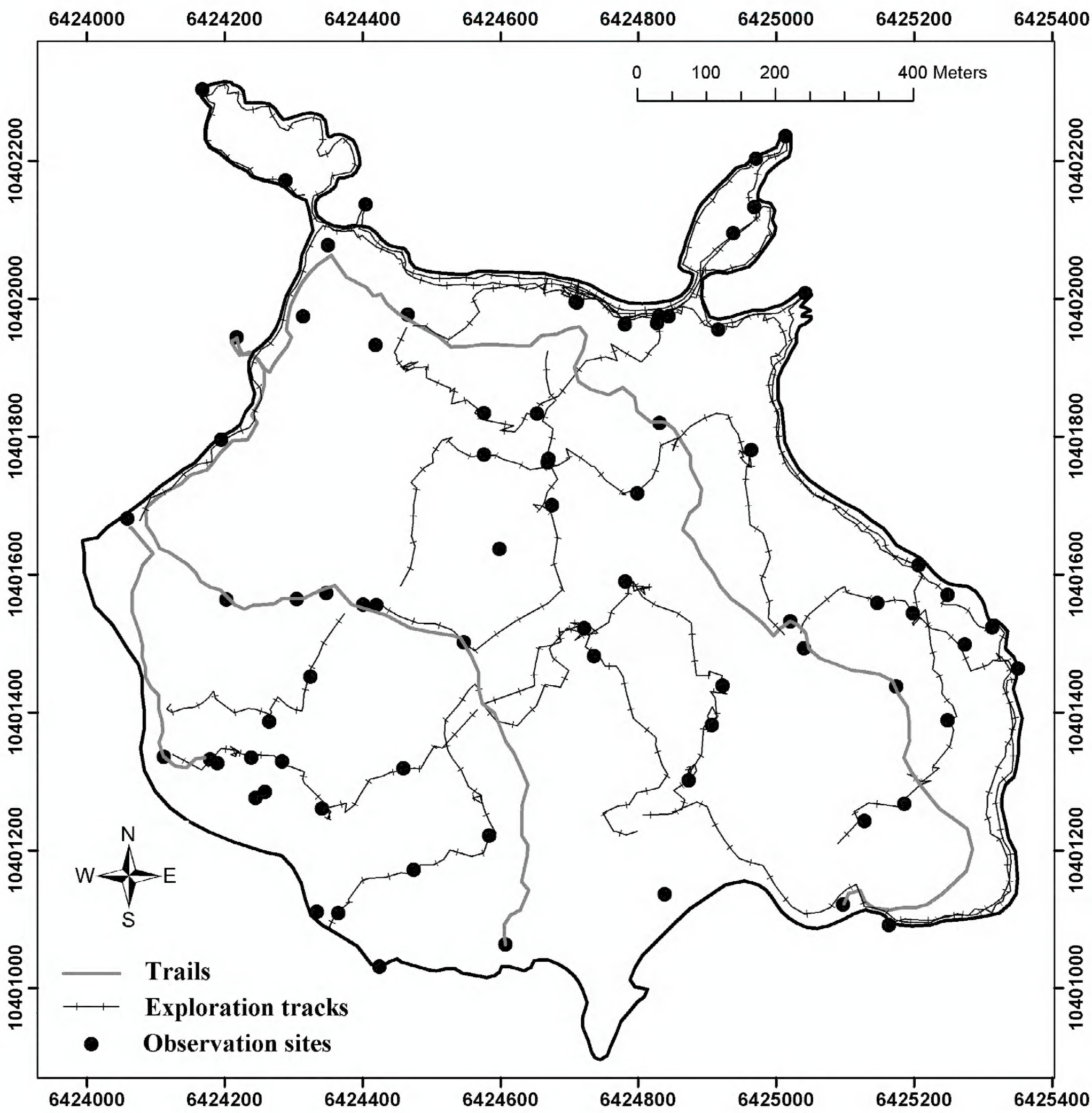

Figure 2. Map of Pulau Babi Tengah showing the exploration tracks and collecting sites (Projection system: WGS 1984 UTM zone 40S, coordinates in meters).

Pulau Pemanggil (Latiff 1982; Turner et al. 1998), Pulau Tinggi (Turner and Yong 1997) and Pulau Sibu (Turner et al. 1993; Turner et al. 1998). The remaining islands are described partly by Henderson (1930) and especially Corner (1985), who concentrated on the islets closer to the mainland, including Pulau Babi Tengah. Corner (1985) recorded 40 species, based on three day-trips done in the years 1932 and 1936, and he described the vegetation indicating that most of the north and east sides were still covered by natural forests, while the west and south sides of the island had been widely planted with coconuts. More recently, a study was done by an internship student from the Netherlands who recorded 70 species (Coolen 2012). The latter provides useful information about the occupation of the island by ca. 10,000 Vietnamese refugees during the years 1975 to 1981. During that period, most of the secondary forests which regenerated from previous coconut plantations from the early 20th century were again deforested to provide wood for construction. A photo taken in the year 1987 shows that the north and east sides of the islands remained mostly untouched (JSEDC 1990).

Data collection

This checklist is based on a compilation of the existing records for Pulau Babi Tengah (Corner 1985; Coolen 2012) and newly collected data. Field work has been carried out from 5–30 September 2013. Plant collections were conducted from explorations out of existing paths and trails, in such a way as to cover all vegetation types on all sides of the island (Figure 2). The necessary authorizations have been provided by the Johor National Parks Corporation and the Forestry Department.

All species were collected when seen for the first time or whenever there was a doubt on their identity. Specimens were prepared using a locally built dryer, and duplicates (up to three when it was possible) have been deposited at the herbaria KEP (Forest Research Institute of Malaysia) and KUL (Herbarium of Institute of Biological Sciences, Faculty of Science, University of Malaya). The third duplicate remained on Pulau Babi Tengah, under the responsibility of Batu Batu Resort, within its Environmental Unit. Mr Azmie Ahmad is the main local staff associated with the collecting is the person in charge of that reference collection.

Species identification

Species names have been identified in a first attempt using existing local checklists published in the region: Henderson 1930; Latiff 1982; Corner 1985; Turner et al. 1993; Turner and Yong 1997; Turner et al. 1998; Jaman and Latiff 1999; Latiff et al. 1999. This allowed us to identify 200 taxa to species level (see specimen labels). Secondly, after the field expedition, first author visited the Herbarium, Forest Research Institute Malaysia (KEP) from 9 October to 4 November 2013. All preliminary identifications were verified or corrected using the KEP reference specimens and literature. The main references used are the *Flora of the Malay Peninsula* (Ridley 1922–1925), the *Tree Flora of Malaya* (Whitmore 1972, 1973; Ng 1978; 1989), the *Flora Malesiana* (many volumes, initiated by Van Steenis 1950), the *Flora of Peninsular Malaysia* (Kiew et al. 2010b; Parris et al. 2010, 2013; Kiew et al. 2011, 2012), and *Wayside trees of Malaya* (Corner 1988). A detailed index to these references, and additional ones, is provided by Turner (1995), which also compiles basic information on species distribution. For ferns, we used the following additional references: Holttum 1954; Piggott 1988. For monocots, we also used Seidenfaden and Wood (1992: orchids), Gilliland (1971: grasses), and Henderson (1954). When necessary, for preliminary identification of some genera and families, we used the practical identification guide of Van Balgooy (1997, 1998, 2001). For exotic species identity and origin status, we complemented our search with Chong et al. (2009) and Milow et al. (2010). Endemic species are defined as being restricted to Peninsular Malaya (Turner 1995); "indigenous" species are defined as non endemic natives; "cultivated" species are not self-sustained populations (cultivated *sensu stricto*) or self-sustained but non spreading populations ("naturalized" *sensu* Richardson et al. 2000); "naturalized" species are self-sustained and spreading populations; "invasive" species are the naturalized species which are considered as threats to biodiversity in other regions (e.g., De Poorter and Browne 2009).

RESULTS

The flora

In total, 308 specimens have been collected and deposited at KEP (274 specimens; first duplicate) and at KUL (195 specimens; second duplicate), in Kuala Lumpur. The third duplicate remained on Pulau Babi Tengah, with Batu Batu Resort (256 specimens). In addition, 54 observation records have been made for species which we judged inappropriate to collect (e.g., well-known or sterile cultivated species). Historical specimens collected in the 1930s by E.J.H. Corner are located at the Herbarium of Singapore Botanic Gardens (SING).

The flora of Pulau Babi Tengah includes 312 taxa (Table 1), of which ca. 16 will require further collecting to confirm or complete identification. Unidentified taxa are named using numbered morphospecies (e.g., *Salacia* sp.1) in order to explicitly account for the number of taxa. The 312 taxa belong to 252 genera and 101 families (APG III 2009; Christenhusz et al. 2011). They include 208 dicotyledons, 70 monocotyledons, four gymnosperms and 30 ferns. Considering biological types, the native flora of Pulau Babi Tengah is represented by 216 taxa corresponding to 77 trees, 54 terrestrial herbs, 39 shrubs (including climbing shrubs, e.g., *Caesalpinia*

Table 1. Number of taxa recorded on Pulau Babi Tengah for the different biological types and for the different status of origin of the taxa (see definitions in materials and methods).

Biological types	Endemic	indigenous	Cultivated	Naturalized	invasive	Total
T (trees)		77	24	4		105
S (shrubs)	1	38	18		2	59
L (woody lianas)	2	13	2			17
C (climbing / creeping herbs)		21	1	3		25
H (terrestrial herbs)	1	53	14	25	2	95
E (epiphytes)		10	1			11
Total	**4**	**212**	**60**	**32**	**4**	**312**

bonduc), 21 climbing/creeping herbs, two woody lianas, and 10 epiphytes. The exotic flora is represented by 96 species corresponding to 28 trees, 41 terrestrial herbs, 20 shrubs, four climbing/creeping herbs, two woody lianas, and one epiphyte. Fifty-seven exotic species are found only cultivated (22 trees, 13 terrestrial herbs, 18 shrubs, one climbing herb, two woody lianas, and one epiphyte). Therefore, the most important naturalized exotic element comes from the herbaceous flora and has invaded mostly the areas of human development (Table 1). The natural and semi-natural forests from the inland and east coast are mostly unaffected by invasive species, both in terms of diversity of the invasive element and in terms of its dominance. *Clidemia hirta* can be observed mostly in the wetter valleys and foothills, but is only represented by localized clumps of few individuals. This situation is contrasting to what is described on most other tropical islands (Denslow et al. 2009). The nearby Pulau Babi Besar, which we visited on a one-day trip, appears obviously more affected, with more exotic species observed on the forested slopes. *Clidemia hirta* is abundant along trails and it is likely that its presence on Pulau Babi Tengah is the result of a recent colonisation event from P. Babi Besar, probably dispersed by birds.

The vegetation

Eleven habitat types are distinguished on Pulau Babi Tengah. These habitat types belong to two distinct categories in Saw's classification (2010), i.e., the "beach vegetation" and the "mangrove forests". Lowland dipterocarp forests (Saw 2010) are absent due to the small size of the island. We regroup our eleven habitat types into five major groups:

Group 1: The mangroves ("mangrove forests" of Saw 2010)—Two mangrove forests (abbreviated "MF") are found on the north coast of the island: one is dominated by *Pemphis acidula* and one dominated *by Rhizophora mucronata*. Two other species, i.e., *Sonneratia griffithii* and *Bruguiera gymnorhiza* are both represented by one single tree.

Group 2: The marshes—Coastal marshes/swamps (CS) once occurred on the north coast and has been completely transformed into a dense grassland as a result of the Vietnamese occupation. The dominant species are *Imperata cylindrica*, *Ischaemum muticum*, and *Mikania cordata*.

Group 3: The coastal zone ("beach vegetation" of Saw 2010, *pro parte*)—The coastal zone occupies a belt from the coast line up to less than 10–30 m inland. It corresponds to what Corner (1985) called the "*Terminalia*-zone" and can be further subdivided into three categories, based on the vegetation physiognomy and types of substrate.

3.a. The coastal sandy beaches (Co) are characterized by a narrow shrubby fringe, generally 1–5 m wide, dominated by shrubs, creepers and terrestrial herbs: *Colubrina asiatica*, *Cyperus radians*, *Ipomoea pes-caprae*, *Lepturus repens*, *Paspalum vaginatum*, *Remirea maritima*, *Scaevola sericea*, *Vigna marina*. Some species previously recorded have not been seen again and could be extinct on the island, *i.e. Schizachyrium brevifolium*, *Spinifex littoreus*.

3.b. The coastal rocky shores (CR) occur mostly on the northeastern side, also on a very narrow belt, and are characterized by rupicolous species, like orchids and dry zone terrestrial species, e.g., Schizaeaceae.

3.c. The coastal forests (CF) occur directly after the habitats 3.a or 3.b and extend also on a relatively narrow belt, up to 30 m inland. On other islands or coastal regions where a coastal plateau occurs, the coastal forests can extend inland up to a few hundred meters. It is characterized by *Atalantia monophylla*, *Barringtonia asiatica*, *Hernandia nymphaeifolia*, *Planchonella obovata*, *Terminalia catappa*, and many other species (43 recorded, see Table 2).

Group 4: The littoral zone ("beach vegetation" of Saw 2010, *pro parte*)—The littoral zone is characterized by the reduction or absence of the typical coastal elements,

Table 2. Number of species for the distinct status of origin of the taxa (see definitions in materials and methods) and for the different habitat-types.

Habitat-Types	Endemic	Indig.	Cultivated	Naturalized	Invasive	Total
Ma (mangrove forests)		5				5
Co (coastal sandy beaches)	1	27		1		29
CR (coastal rocky shores)		15		1		16
CF (coastal forests)	1	40		2		43
CS (Coastal marshes / swamps		7				7
Subtotal (coastal)	2	86		3		91
DF (dry littoral forests)		15				15
MF (mesic littoral forests)	3	67				70
VF (valley littoral forests)	1	27	1	1	1	31
Subtotal (littoral)	3	101	1	1	1	107
2F (secondary forests)		3		1		4
An (anthropic areas)		25	59	29	3	116
Pi (pioneer vegetation)		21			2	23
Subtotal (secondary)		42	59	29	3	133
Total	**4**	**212**	**60**	**32**	**4**	**312**

e.g., *Barringtonia asiatica*, by the higher species diversity (107 species) compared to the coastal forests, and by the dominance of some species such as *Syzygium grande*. This zone corresponds to what was named the "*Eugenia grandis*-zone" by Corner (1985). It can extend several km inland, depending on topography and climate. On islands with a steep topography, this zone can be restricted to a few hundred meters, or absent due to human impact. We further subdivide this zone into three categories based on the drought effect due to sea sprays during the north-east monsoon (windward vs. leeward slopes) and based on soil drainage due to landform patterns (valleys vs. slopes and ridges).

4.a. The mesic littoral forests (MF) are the most widespread habitat type. They still cover most of the ridges and slopes of the center of the island. The most characteristic species here are *Barringtonia macrostachya*, *Gironniera subaequalis*, *Gnetum gnemon*, *Maranthes corymbosa*, *Palaquium obovatum*, and *Syzygium grande*.

4.b. The valley littoral forests (VF) are more localized and found on stretches 3–10 m wide along the valleys and ravines (concave landforms). They share many species with the mesic forests and are characterized by the diversity and abundance of lianas and palms, e.g., *Arenga brevipes*, *Bauhinia semibifida*, *Caryota mitis*, *Flagellaria indica*, *Oncosperma tigillarium*. Some herbs and ferns are also found frecuently, e.g., *Homalomena sagittifolia*, *Mapania palustris*, *Pronephrium asperum*, *Taenitis blechnoides*.

4.c. The dry littoral forests (DF) are found on the eastern slopes, exposed to the north-eastern monsoon. These forests share many elements of the mesic forests and are characterized by the dominance of *Podocarpus polystachyus* and species such as *Dillenia pulchella*, *Pandanus odoratissimus*, *Rhodamnia cinerea*, *Syzygium zeylanicum*.

Group 5: The secondary and anthropic vegetation types—Here, we distinguish three entities based on the disturbance factor and development stage.

5.a. The pioneer vegetation (Pi) includes the deforested stands which are regenerating naturally after punctual human impact or natural tree fall gaps. Relatively few exotic species are observed. The most common native species include *Cissus hastata*, *Dicranopteris linearis*, *Gynochthodes sublanceolata*, *Hedyotis capitellata*, *Macaranga javanica*, *Melastoma malabathricum*, *Pteridium caudatum*, and *Tetracera scandens*.

5.b. The secondary forests (2F) correspond to pioneer stands which have recovered their forest cover. They are found mostly on the margins of the areas deforested during the Vietnamese civil war, i.e., on the southwestern slopes. They are characterized by a dense regrowth of *Syzygium grandis* about 10–15 m tall.

5.c. The anthropic areas (An) include all the areas continuously affected by human influence, like the cultivated lands, gardens, waste lands, and developed coastal areas. Most of the naturalized and invasive exotic species are found there. Possibly native species include *Acalypha indica*, *Blechnum finlaysonianum*, *Cyclosorus dentatus*, *Dactyloctenium aegyptium*, *Eleusine indica*, and *Physalis minima*.

The highest number of species is observed in the anthropic area (An, 116 species), seconded by the mesic littoral forests (MS, 70 species, Table 2). But if we consider the native species only (endemic + indigenous), the mesic littoral forests are the richest (70 species vs. 25 for the anthropic areas), i.e., all species observed in the mesic littoral forests are natives. The invasive species are observed in natural habitats only in the coastal habitat types and in the valley forests (*Clidemia hirta*). This situation contrasts with other tropical islands which are generally strongly impacted by these invasive species (Baret et al. 2006).

The checklist

The exhaustive list of species recorded from Pulau Babi Tengah is presented in Table 3 along with the most relevant information on these species, i.e., biological types, preferred habitat-types on the island, rarity on the island, and origin status. Most species have been photographed in their natural habitat and the images will be presented on the Batu Batu resort website (http://www.batubatu.com.my) in the form of thematic galleries where other important information will be made available, e.g., vernacular names. About 2,000 images of plants have been taken and managed using ThumbsPlus (http://www.cerious.com) and Microsoft Access.

DISCUSSION

Rare species and endemic species

Margaritaria indica is one of the most interesting discoveries and it is a relatively common coastal tree on Pulau Babi Tengah. This species is widely distributed from India to Indo-China, and is scattered through Malesia. In its Peninsular Malaysian range, it is known only from a few islands in the Pulau Tioman group (Pulau Pemanggil, Pulau Sibu Tengah and two small islets to the north of P. Tioman (Turner et al. 1998). It is here recorded for the first time on Pulau Babi Tengah.

Mangifera pentandra: This tree is classified as vulnerable by IUCN (2013), and it is characteristic of coastal forests, which is a habitat remaining pristine only in poorly inhabited coasts. It has been recorded from Pulau Tinggi and was once a common village tree in Peninsular Malaysia and old orchards are found in Peninsular Thailand. It is suspected that the interest in the species is declining in favour of *M. indica*, although it is still useful in improving the genetic stock of the common mango (Turner 1995).

Sonneratia griffithii: Widely distributed species, from Bengal, Burma, Lower Siam, Mergui, Andamans. In Malaysia, it is recorded only from the West Malay Peninsula and is said to be very rare (most records being misidentifications of *S. caseolaris* (L.) Engl., which differs in the leaf shape, not obovate, and characteristics of the fruit).

Arachnis hookeriana: This species is known from Borneo, Riau archipelago and other islands south of Singapore. Turner (1995) records it in scrub near the seashore, commonest along the east coast. Within the Pulau Tioman group, it is recorded on Pulau Sibu (Turner et al. 1993).

Eulalia ridleyi: This is an endemic species to Peninsular Malaya, rare and locally found in coastal sand dunes on the east coast. It is recorded from Johor Jambu Larang (Feilding), Pahang, Sungei Meang and Rumpin rivers, Rahman, and Kota Bharu (Yapp). Other Malayan endemic species found on Pulau Babi Tengah are *Calamus burkillianus*, *Dracaena maingayi* and *Rourea rugosa*.

Nephrolepis acutifolia: Widely distributed species, locally rare and found often near the sea (in Malaysia). It is considered as near threatened by IUCN. Other relatively uncommon species include *Actinostachys digitata*, *Ardisia ridleyi*, *Cerbera manghas*, *Litsea johorensis*, and *Schizaea dichotoma*.

Two species might be new records for the flora of Peninsular Malaysia, but one of them needs to be confirmed based on fertile specimen (*Arenga brevipes*) and the second one (*Pavetta multiflora*), collected in fruits, should be confirmed by a specialist of the genus. Reference specimens have been compared and matched with our specimens. Several other species from the Pulau Tioman group have a Bornean distribution and are absent from the mainland (Latiff et al. 1999; Phang et al. 2008).

Locally extinct species

Several species recorded by Corner (1985) on Pulau Babi Tengah have not been observed during our survey. Although we might have missed some of them (*Allophyllus cobbe*, *Cordia subcordata*, *Schizachyrium brevifolium*), the others are very noticeable coastal species and are possibly extinct: *Heritiera littoralis* (possibly removed for the Vietnamese refugees camp), *Tournefortia argentea* (very rare, also recorded from Pulau Langkawi and Pulau Tinggi), *Erythrina variegata* (also disappeared from the neighbouring islands; Turner 1993), *Tristellateia australasiae*, and *Spinifex littoreus*. Among these, *Schizachyrium brevifolium* was only recorded from Pulau Babi Tengah for the Malay Peninsula.

Potential threats

Some exotic species naturalized on Pulau Babi Tengah are often considered as invasive species in other regions and they need to be monitored to record their spread (or non-spread) into the distinct natural habitat types of the islands. These species are mostly *Chromolaena odorata*, *Clidemia hirta*, *Epipremnum pinnatum*, *Lantana camara*, *Leucaena leucocephala*, and *Mikania cordata*. Among these, only *Clidemia hirta* has been observed in natural forests (valley forests).

Potential uses

The flora of Pulau Babi Tengah contains about 30 native species which we consider as having good potential as ornamental species. Rather than importing more exotic species to the island for landscaping, it is advisable to consider the development of sustainable propagation of some of these species. This could also allow developing restoration projects for the degraded west side of the island. The most interesting species include climbers (*Bauhinia semibifida* and *Hoya diversifolia*), epiphytes (*Dischidia major* and the orchid species), light tolerant trees (*Cycas edentata*, *Fagraea auriculata*, *Pemphis acidula*, and *Podocarpus polystachyus*) and herbs (*Dianella ensifolia*), and shade tolerant shrubs (*Clerodendrum myrmecophila*, *Dillenia pulchella*, *Dracaena elliptica*, *D. maingayi*, and *Pandanus tetrodon*) or herbs (*Staurogyne setigera*).

Conclusion

Very few islands in the Pulau Tioman group have been inventoried exhaustively, mostly because of the more complex diversity of the bigger islands such as Tioman. Our study provides the baseline data for further studies on the invasion process and on the patterns of biodiversity on small island ecosystems, as models for understanding evolution processes. The most remarkable characteristic of Pulau Babi Tengah is the rarity of the exotic element, almost absent from non-anthropic areas. Only one other island in the group has been inventoried to more than 90% (Pulau Sibu, ca. 450 ha, 154 m elevation, ca. 390 vascular plants (Turner et al. 1993) and constitutes a good site for more detailed comparative studies. Our inventory of the plant life of Pulau Babi Tengah also provides detailed information for Batu Batu Resort in order to develop responsible ecotourism on this island. Nevertheless, non-vascular plants remain to be studied (30–40 species to be expected, K.T. Yong, pers. comm.) as well as fungi, which constitute an important group of organisms in these small island ecosystems.

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Table 3. Checklist of the terrestrial vascular plant species recorded from Pulau Babi Tengah. Previous records ("PR") are indicated for Pulau Babi Tengah: C, Corner (1985), Q, Quijrin Coolen (2012, unpublished). All specimens cited ("Specimen n°") are collected by *B. Senterre* (*6595-6645*), *B. Senterre and K.F. Senafi* (*6646-6682*) and *B. Senterre and A. Ahmad* (*6683-6902*). Observation records are indicated with the abbreviation "o.r.", and when nothing is indicated for the "Specimen n°" the species record is from the literature only. Observed characters ("Compo") are abbreviated as follows: st, sterile; fert, fertile; flb, flower bud; fl, flower; fr, fruit. Prefered habitat-types ("Hab.-Type") are abbreviated as follows: 2F, secondary forests ; An, anthropic areas ; CF, coastal forests ; Co, coastal sandy beaches ; CR, coastal rocky shores ; CS, coastal marshes / swamps ; DF, dry littoral forests ; MF, mesic littoral forests ; MF, mangrove forest ; Pi, pioneer vegetation ; VF, valley littoral forests. Biological Types (TB) are abbreviated as follows: T, trees; S, shrubs (including climbing shrubs, e.g., *Caesalpinia bonduc*); L, woody lianas; C, climbing / creeping herbs; H, terrestrial herbs; E, epiphytes (incl. rupicolous species). Origin status (Orig) is abbreviated as follows: end, endemic; ind, indigenous; cult, cultivated; nat, naturalized; inv, invasive (see definitions in materials and methods). Rarity is abbreviated as follows: R, rare; O, occasional; F, frequent; C, common; A, abundant.

(A) Dicotyledons (Palaeodicots and Eudicots)

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Acanthaceae	*Asystasia gangetica* (L.) T.Anderson subsp. *micrantha* (Nees) Ensermu		6775	fl, fr	An	H	inv	F
Acanthaceae	*Staurogyne setigera* (Nees) Kuntze		6605	fl	VF	H	ind	R
Aizoaceae	*Sesuvium portulacastrum* (L.) L.		6847	fert	An	H	ind	F
Amaranthaceae	*Alternanthera sessilis* (L.) R.Br. ex Roth		6896	fert	An	H	cult	O
Amaranthaceae	*Amaranthus dubius* Mart. ex Thell.		6845	fert	An	H	nat	F
Anacardiaceae	*Anacardium occidentale* L.		6744	st	2F	T	nat	O
Anacardiaceae	*Buchanania arborescens* (Blume) Blume		6610, 6632, 6717	st	MF	T	ind	F
Anacardiaceae	*Mangifera indica* L.		o.r.		An	T	cult	F
Anacardiaceae	*Mangifera pentandra* Hook.f.		6829	st	CF	T	ind	O
Annonaceae	*Desmos dasymaschalus* (Blume) Safford var. *wallichii* (Hook.f. & Thomson) Ridl.		6616	st	MF	S	ind	F
Apocynaceae	*Allamanda cathartica* L.		o.r.		An	C	cult	F
Apocynaceae	*Alstonia spatulata* Blume		6699	st	MF	T	ind	R
Apocynaceae	*Alyxia reinwardtii* Blume		6641, 6748	st	MF	C	ind	O
Apocynaceae	*Catharanthus roseus* (L.) G.Don		o.r.		An	H	nat	F
Apocynaceae	*Cerbera manghas* L.		6761	st	CF	T	ind	R
Apocynaceae	*Cynanchum ovalifolium* Wight		6745	fl, fr	Pi	C	ind	O
Apocynaceae	*Dischidia major* (Vahl) Merr.	C	o.r.		DF, CF	C	ind	O
Apocynaceae	*Hoya diversifolia* Blume	C	6899	fl	CF	C	ind	O
Apocynaceae	*Nerium oleander* L.		o.r.		An	S	cult	O
Apocynaceae	*Parsonsia alboflavescens* (Dennst.) Mabb.		6825	fl	Co	C	ind	R
Apocynaceae	*Plumeria obtusa* L.		o.r.		An	T	cult	F
Araliaceae	*Arthrophyllum diversifolium* Blume		6794	st	MF	T	ind	F
Asteraceae	*Ageratum conyzoides* L.		6849	fl	An	H	nat	F
Asteraceae	*Blumea balsamifera* (L.) DC.		6872	st	Pi	S	ind?	R
Asteraceae	*Chromolaena odorata* (L.) R.M.King. & H. Robuns.		6767	fl	An, Pi	H	inv	C
Asteraceae	*Emilia sonchifolia* (L.) DC.		6838	fl, fr	An	H	ind?	F
Asteraceae	*Mikania cordata* (Burm.f.) Robinson		6685	fl	CS	C	ind	F
Asteraceae	*Synedrella nodiflora* Gaertn.		6776	fl, fr	An	H	nat	F
Asteraceae	*Tridax procumbens* L.		6837	fl, fr	An	H	nat	F
Asteraceae	*Vernonia cinerea* (L.) Less.		6836	fl, fr	An	H	ind?	F
Asteraceae	*Wollastonia biflora* (L.) DC.	C	6805	st	An	H	ind?	R
Boraginaceae	*Cordia subcordata* Lam.	C			CF	T	ind	
Boraginaceae	*Tournefortia argentea* L.f.	C			Co	S	ind	
Burseraceae	*Canarium pilosum* Benn.		6795	st	VF	T	ind	F
Capparaceae	*Capparis micracantha* DC. subsp. *korthalsiana* (Miq.) M.Jacobs		6638	st	MF	S	ind	R
Caricaceae	*Carica papaya* L.		o.r.		An	T	cult	F
Casuarinaceae	*Casuarina equisetifolia* L.	C	6648	fr	An	T	ind	F
Celastraceae	*Salacia* sp.1		6624	st	MF	L	ind	F
Chrysobalanaceae	*Maranthes corymbosa* Blume		6702, 6714, 6732, 6758	st	MF	T	ind	F
Cleomaceae	*Arivela viscosa* (L.) Raf. var. *viscosa*		6848	fl, fr	An	H	nat	F
Clusiaceae	*Calophyllum depressinervosum* M.R. Hend. & Wyatt-Sm.		6614	st	MF	T	ind	O
Clusiaceae	*Calophyllum inophyllum* L.		6735, 6756	st	MF, CF	T	ind	F
Clusiaceae	*Clusia rosea* L.		6831	fl	An	S	cult	O
Clusiaceae	*Garcinia mangostana* L		o.r.		An	T	cult	F
Clusiaceae	*Garcinia nigrolineata* Planch. ex T. Anderson	C	6609, 6757	fr	MF, DF	T	ind	F
Clusiaceae	*Garcinia parvifolia* (Miq.) Miq.		6801	st	MF	S	ind	F

Continued

Table 3. *Continued.*

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Combretaceae	*Terminalia catappa* L.	C	6655	st	CF	T	ind	F
Connaraceae	*Connarus monocarpus* L. subsp. *malayensis* Leenh.		6859	st	MF	L	ind	O
Connaraceae	*Rourea fulgens* Planch.		6626	st	MF	L	ind	F
Connaraceae	*Rourea minor* (Gaertn.) Alston		6619	st	MF	L	ind	F
Connaraceae	*Rourea rugosa* Planch.		6612	st	MF	L	end	F
Convolvulaceae	*Ipomoea littoralis* Blume		6654, 6686	fl	CF	C	ind	O
Convolvulaceae	*Ipomoea pes-caprae* (L.) Sweet	Q	6807	fl	Co	C	ind	C
Cucurbitaceae	*Melothria pendula* L.		6785	fl, fr	An	C	nat	F
Dilleniaceae	*Dillenia pulchella* (Jack) Gilg		6857	st	DF	T	ind	O
Dilleniaceae	*Tetracera scandens* (L.) Merr.		6658, 6668	fr	Pi	L	ind	F
Ebenaceae	*Diospyros ferrea* (Willd.) Bakh.	C	6813	st	CF	T	ind	O
Ebenaceae	*Diospyros lanceifolia* Roxb.		6701	st	MF	T	ind	O
Elaeocarpaceae	*Elaeocarpus floribundus* Blume var. *floribundus*		6727	st	MF	T	ind	F
Ericaceae	*Vaccinium leptanthum* Miq.		6726	st	Pi	E	ind	F
Erythroxylaceae	*Erythroxylum cuneatum* (Miq.) Kurz		6723	st	CF	T	ind	F
Euphorbiaceae	*Acalypha indica* L.		6846	fert	An	H	ind?	F
Euphorbiaceae	*Antidesma ghaesembilla* Gaertn.		6751	st	2F	T	ind	R
Euphorbiaceae	*Antidesma velutinosum* Blume		6625	st	MF	S	ind	O
Euphorbiaceae	*Austrobuxus nitidus* Miq. var. *nitidus*		6711	fr	CF	T	ind	O
Euphorbiaceae	*Baccaurea* sp.1		6700	st	MF	S	ind	F
Euphorbiaceae	*Breynia racemosa* (Blume) Müll.Arg.		6750, 6861	fr	Pi	S	ind	O
Euphorbiaceae	*Codiaeum variegatum* L.		o.r.		An	S	cult	F
Euphorbiaceae	*Endospermum diadenum* (Miq.) Airy Shaw		6802	st	MF	T	ind	O
Euphorbiaceae	*Euphorbia heterophylla* L.		6774	fr	An	H	nat	F
Euphorbiaceae	*Euphorbia hirta* L.		6770	fl, fr	An	H	nat	C
Euphorbiaceae	*Macaranga javanica* (Blume) Müll.Arg.		6737	st	An, Pi	T	ind?	F
Euphorbiaceae	*Macaranga tanarius* (L.) Müll.Arg.		6809	st	CF	T	ind?	O
Euphorbiaceae	*Manihot esculenta* Crantz		o.r.		An	S	cult	F
Euphorbiaceae	*Margaritaria indica* (Dalzell) Airy Shaw		6661	fl	CF	T	ind	F
Euphorbiaceae	*Phyllanthus amarus* Schum. & Thonn.		6780	fl, fr	An	H	nat	C
Euphorbiaceae	*Phyllanthus oxyphyllus* Miq.		6746, 6870	fl, fr	MF	S	ind	O
Euphorbiaceae	*Sauropus androgynus* (L.) Merr.		6784	fl, fr	An	S	cult	R
Euphorbiaceae	*Suregada multiflora* (Juss.) Baill. var. *multiflora*	C	6640, 6749	fr	Co, 2F	T	ind	C
Fabaceae	*Alysicarpus vaginalis* (L.)DC.		6852	st	An	H	ind?	R
Fabaceae	*Archidendron bubalinum* (Jack) I.C. Nielsen		6603, 6623, 6730	fr	VF, MF	T	ind	F
Fabaceae	*Baphia nitida* Lodd.		6786	fl	An	S	cult	C
Fabaceae	*Bauhinia kockiana* Korth.		o.r.		An	L	cult	F
Fabaceae	*Bauhinia semibifida* Roxb. var. *semibifida*		6716	st	VF	L	ind	O
Fabaceae	*Caesalpinia bonduc* (L.) Roxb.	CQ	6804	st	Co	S	ind	O
Fabaceae	*Callerya atropurpurea* (Wall.) Schot		6790	st	An	T	cult	R
Fabaceae	*Canavalia rosea* (Sw.) DC.	Q	6806	fl, fr	Co	C	ind	O
Fabaceae	*Dalbergia candenatensis* (Dennst.) Prain		6810	fl	Co	S	ind	R
Fabaceae	*Delonix regia* (Hook.f.) Raf.		o.r.		An	T	cult	O
Fabaceae	*Dendrolobium umbellatum* (L.) Benth.)	C	6649	fl, fr	Co	S	ind	C
Fabaceae	*Derris trifoliata* Lour.		6823	st	Co	L	ind	F
Fabaceae	*Desmodium triflorum* (L.) DC		6856	st	An	H	nat?	C
Fabaceae	*Entada spiralis* Ridl.		6764	st	MF	L	ind	R
Fabaceae	*Erythrina variegata* L.	C			CF	T	ind	
Fabaceae	*Leucaena leucocephala* (Lam) De Wit	Q	6777	fr	An	T	nat	C
Fabaceae	*Mimosa pudica* L.		o.r.		An	H	nat	F
Fabaceae	*Pongamia pinnata* (L.) Pierre var. *pinnata*		6824	fl, fr	CF	T	ind	O
Fabaceae	*Tamarindus indica* L.		6778	st	An	T	cult	O
Fabaceae	*Vigna marina* (Burm.) Merr.		6808	fl, fr	Co	C	ind	O
Fabaceae	Fabaceae sp.1		6630	st	MF	L	ind	F
Goodeniaceae	*Scaevola sericea* Vahl	CQ	6650	fl, fr	Co	S	ind	C
Hernandiaceae	*Hernandia nymphaeifolia* (Presl) Kubitzki		o.r.		CF	T	ind	R
Ixonanthaceae	*Ixonanthes reticulata* Jack		6597	fr	DF	T	ind	O
Lamiaceae	*Ocimum basilicum* L.		6895	fr	An	H	cult	R
Lamiaceae	*Ocimum tenuiflorum* L.		6892	fl, fr	An	H	nat	F
Lauraceae	*Cassytha filiformis* L.	CQ	6651	flb, fr	Co	C	ind	C

Continued

Table 3. *Continued.*

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Lauraceae	*Cinnamomum iners* Reinw. ex Bl. var. *subcuneatum* (Miq.) W.K.Soh		6897	st	An	T	cult	F
Lauraceae	*Litsea elliptica* Blume		6797	st	VF	T	ind	R
Lauraceae	*Litsea johorensis* Gamble		6739	st	MF	T	ind	R
Lauraceae	*Neolitsea zeylanica* (Nees) Merr.		6762	st	CF	T	ind	F
Lecythidaceae	*Barringtonia asiatica* (L.)Kurz	CQ	6828	st	CF	T	ind	F
Lecythidaceae	*Barringtonia macrostachya* (Jack) Kurz	C	6639	st	MF	T	ind	C
Loganiaceae	*Fagraea auriculata* Jack subsp. *auriculata*		6814	st	CF	T	ind	R
Lythraceae	*Pemphis acidula* Forst.	C	6601	fl, fr	Ma	T	ind	C
Lythraceae	*Sonneratia griffithii* Kurz		6880	fr	Ma	T	ind	R
Malpighiaceae	*Tristellateia australasiae* A. Rich.	C			Ma	C	ind?	
Malvaceae	*Durio zibethinus* Rumph. ex Murray		o.r.		An	T	cult	O
Malvaceae	*Heritiera javanica* (Blume) Kosterm.		6709	st	MF	T	ind	O
Malvaceae	*Heritiera littoralis* Dryand.	C			CF	T	ind	
Malvaceae	*Hibiscus mutabilis* L		o.r.		An	S	cult	R
Malvaceae	*Hibiscus tiliaceus* L.	CQ	6827	fl, fr	CF	T	ind	F
Malvaceae	*Hibiscus tiliaceus* L.'Hilo Rainbow'		o.r.		An	S	cult	O
Malvaceae	*Scaphium macropodum* (Miq.) Beumée ex Heyne		6867	st	VF	T	ind	R
Melastomataceae	*Clidemia hirta* (L.) D.Don		6868	st	VF	S	inv	R
Melastomataceae	*Melastoma malabathricum* L.	Q	6713	fl, fr	Pi	S	ind?	C
Melastomataceae	*Memecylon ovatum* Sm.		6683	fr	CF	T	ind	F
Meliaceae	*Azadirachta indica* A.Juss.		6843	st	An	T	cult	F
Meliaceae	*Lansium domesticum* Corrêa		6889	st	An	T	cult	R
Menispermaceae	*Fibraurea tinctoria* Lour.		6644	st	MF	L	ind	C
Menispermaceae	*Pericampylus glaucus* (Lam.) Merr.		6653	st	Co	C	ind?	O
Moraceae	*Artocarpus dadah* Miq.		6755, 6885	fr	MF	T	ind	O
Moraceae	*Artocarpus heterophyllus* Lam.		o.r.		An	T	cult	O
Moraceae	*Artocarpus integer* (Thunb.) Merr. var. integer		o.r.	fr	An	T	cult	R
Moraceae	*Ficus caulocarpa* Miq.		6652	fr	CF	T	ind	C
Moraceae	*Ficus fistulosa* Reinw. ex Blume		6796	st	VF, An	T	ind	F
Moraceae	*Ficus grossularioides* Burm.f.		6675	fr	MF	S	ind	F
Moraceae	*Ficus vasculosa* Wall. ex Miq.		6708	st	MF	S	ind	O
Myristicaceae	*Knema globularia* (Lam.) Warb.		6620, 6763	flb, fr	MF, VF	T	ind	F
Myrsinaceae	*Ardisia elliptica* Thunb.		6634	flb, fr	Pi	S	ind?	F
Myrsinaceae	*Ardisia korthalsiana* Scheff.		6765	fl	MF	S	ind	R
Myrsinaceae	*Ardisia ridleyi* King & Gamble		6792	fl, fr	MF	S	ind	O
Myrtaceae	*Psidium guajava* L.		o.r.		An	T	cult	O
Myrtaceae	*Rhodamnia cinerea* Jack		6706	st	DF, MF	T	ind	C
Myrtaceae	*Syzygium aqueum* (Burm.f.) Alston		6842, 6866	fl	VF, An	T	nat	O
Myrtaceae	*Syzygium campanulatum* Korth.		6890	st	An	T	cult	F
Myrtaceae	*Syzygium grande* (Wight) Walp.	C	6628, 6629, 6631, 6635	flb, fr	MF, 2f	T	ind	A
Myrtaceae	*Syzygium zeylanicum* (L.) DC.		6860	fr	DF	T	ind	F
Nyctaginaceae	*Bougainvillea glabra* Choisy		o.r.		An	L	cult	F
Oleaceae	*Chionanthus ramiflorus* Roxb.		6622, 6710, 6791	fl, flb, fr	DF, CF	S	ind	F
Oleaceae	*Jasminum sambac* (L.) Ait.		6891	fl	An	S	cult	O
Opiliaceae	*Champereia manillana* (Blume) Merr.		6618, 6627, 6696, 6719	fl, fr	CF, MF	S	ind	F
Oxalidaceae	*Averrhoa carambola* L.		o.r.		An	T	cult	O
Pandaceae	*Microdesmis casearifolia* Planch.		6617, 6637	st	MF	T	ind	F
Passifloraceae	*Passiflora foetida* L.		6811	fr	Co	C	nat	F
Piperaceae	*Peperomia pellucida* (L.) H.B. & K.		6902	fert	An	H	nat	O
Piperaceae	*Piper caninum* Blume		6681	st	VF	C	ind?	R
Polygalaceae	*Xanthophyllum vitellinum* (Blume) Dietr.		6733	st	MF	T	ind	R
Rhamnaceae	*Colubrina asiatica* (L.) Brongn.		6646	fl, fr	Co	S	ind	C
Rhizophoraceae	*Bruguiera gymnorhiza* Lam.	Q	6883	fl, fr	Ma	T	ind	R
Rhizophoraceae	*Rhizophora mucronata* Lam.	Q	6600	flb	Ma	T	ind	C
Rubiaceae	*Canthium confertum* Korth.		6734	st	MF	S	ind	O
Rubiaceae	*Chassalia chartacea* Craib		6595, 6621, 6695	fr	MF	S	ind	F
Rubiaceae	*Diplospora malaccensis* Hook.f.		6697	st	MF	S	ind	R
Rubiaceae	*Guettarda speciosa* L.	CQ	6662	st	CF	T	ind	F

Continued

Table 3. *Continued.*

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Rubiaceae	*Gynochthodes sublanceolata* Miq.		6712	fr	Pi	C	ind	F
Rubiaceae	*Hedyotis capitellata* Wall. ex G.Don		6736	fr	Pi	C	ind	F
Rubiaceae	*Hedyotis philippinensis* (Willd. ex Spreng.) Merr. ex C.B. Rob.		6864	fert	VF	S	ind	R
Rubiaceae	*Ixora coccinea* L.		o.r.		An	S	cult	F
Rubiaceae	*Ixora congesta* Roxb.		6604	flb	MF, VF	S	ind	F
Rubiaceae	*Ixora lobbii* King & Gamble		6615	st	MF	S	ind	C
Rubiaceae	*Ixora pendula* Jack var. *pendula*		6705	fr	MF	S	ind	O
Rubiaceae	*Lasianthus cynocarpus* Jack		6636, 6677	fl, fr	MF	S	ind	C
Rubiaceae	*Lasianthus pergamaceus* King & Gamble		6871	st	MF	T	ind	F
Rubiaceae	*Morinda citrifolia* L.	CQ	6647	fl, fr	CF	T	ind?	F
Rubiaceae	*Oldenlandia corymbosa* L.		6769, 6854	fl, fr	An	H	ind?	C
Rubiaceae	*Paederia verticillata* Blume		6645	st	MF	L	ind	R
Rubiaceae	*Pavetta multiflora* (Koord. & Valeton) Bremek.		6607	fr	MF	S	ind	O
Rubiaceae	*Prismatomeris glabra* (Korth.) Valeton		6793	st	DF	S	ind	R
Rubiaceae	*Psychotria obovata* Wall.		6633	fl, fr	MF, CF	H	ind	C
Rubiaceae	*Spermacoce assurgens* Ruiz & Pav.		6835	fl, fr	An	H	nat	C
Rubiaceae	*Timonius compressicaulis* (Miq.) Boerl.	C	6656	fr	CF	T	ind	F
Rubiaceae	*Timonius wallichianus* (Korth.) Valeton		6803	st	MF	T	ind	O
Rutaceae	*Atalantia monophylla* (L.) DC.	CQ	6660	st	CF	T	ind	C
Rutaceae	*Maclurodendron porteri* (Hook.f) T. G. Hartley		6725	st	MF	T	ind	O
Rutaceae	*Murraya koenigii* (L.) Spreng.		6783	st	An	S	cult	O
Rutaceae	*Murraya paniculata* (L.) Jack		6855	fr	An	S	cult	F
Sapindaceae	*Allophyllus cobbe* (L.) Raeusch.	C			Co	S	ind	
Sapindaceae	*Dimocarpus longan* Lour. subsp. *malesianus* Leenh		6894	st	An	T	cult	F
Sapindaceae	*Dodonaea viscosa* Jacq.		6773	st	An	S	ind	R
Sapindaceae	*Guioa pleuropteris* (Blume) Radlk.		6669, 6731	flb, fr	CF, Pi	T	ind	F
Sapindaceae	*Lepisanthes fruticosa* (Roxb.) Leenh.		6704, 6747	st	MF	T	ind	F
Sapindaceae	*Nephelium lappaceum* L.		6888	st	An	T	cult	F
Sapotaceae	*Manilkara zapota* (L.) P.Royen		o.r.		An	T	cult	F
Sapotaceae	*Palaquium obovatum* (Griff.) Engl.		6608, 6863, 6900	fl	MF	T	ind	C
Sapotaceae	*Planchonella obovata* (R.Br.) Pierre	C	6812, 6881	st	CF	T	ind	F
Scrophulariaceae	*Lindernia crustacea* (L.) F.Muell.		6851	fl, fr	An	H	ind	O
Simaroubaceae	*Eurycoma longifolia* Jack		6715	st	MF	T	ind	F
Solanaceae	*Physalis minima* L.		6884	fl, fr	An	H	ind	O
Ulmaceae	*Gironniera subaequalis* Planch.		6611	st	MF	T	ind	F
Urticaceae	*Pilea microphylla* (L.) Liebm.		o.r.		An	H	nat	F
Verbenaceae	*Clerodendrum myrmecophila* Ridl.		6759	st	MF	S	ind	O
Verbenaceae	*Lantana camara* L.	Q	6768	fl	An, Pi	S	inv	C
Verbenaceae	*Premna serratifolia* L.	C	6599	fl, fr	Co	T	ind	C
Verbenaceae	*Teijsmanniodendron coriaceum* (C.B. Clarke) Kosterm.		6799	st	VF	T	ind	R
Verbenaceae	*Vitex pinnata* L.	C	6663	st	CF	T	ind	C
Verbenaceae	*Vitex trifolia* L. var. *repens* Ridley		6820	fr	Co	S	ind	O
Vitaceae	*Cissus hastata* Miq.		6752	st	Pi	C	ind	O
Vitaceae	*Leea indica* (Burm.f.) Merr.		6692	fr	VF, Pi	T	ind	O

(B) Monocotyledons

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Agavaceae	*Cordyline fruticosa* (L)A.Chev.		o.r.		An	S	cult	O
Amaryllidaceae	Amaryllidaceae sp.1		o.r.		An	H	cult	F
Araceae	*Alocasia longiloba* Miq.		o.r.		An	H	cult	O
Araceae	*Alocasia macrorrhizos* (L.) G.Don		o.r.		An	H	nat	F
Araceae	*Dieffenbachia seguine* (Jacq.) Schott		o.r.		An	H	nat	O
Araceae	*Epipremnum pinnatum* (L.) Engl.		o.r.		An	C	nat	O
Araceae	*Homalomena sagittifolia* Jungh. ex Schott		6865, 6887	fl	VF	H	ind?	O
Araceae	*Philodendron bipinnatifidum* Schott ex Endl.		o.r.		An	H	cult	O
Arecaceae	*Areca catechu* L.		6841	st	An	T	cult	F
Arecaceae	*Arenga brevipes* Becc.		6679	st	VF	H	ind	O
Arecaceae	*Calamus burkillianus* Becc. ex Ridl.	Q	6670	fl, fr	MF, VF	L	end	C
Arecaceae	*Caryota mitis* Lour.	Q	6682	st	VF, An	T	ind	F
Arecaceae	*Chrysalidocarpus lutescens* Wendl.		6839	st	An	T	cult	F

Continued

Table 3. *Continued.*

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Arecaceae	*Cocos nucifera* L.	CQ	o.r.		CF, An	T	nat	F
Arecaceae	*Licuala grandis* H.Wendl.		o.r.		An	S	cult	F
Arecaceae	*Licuala spinosa* Wurmb.		6858	st	MF	H	ind	R
Arecaceae	*Metroxylon sagu* Rottb.	Q	6690	fr	VF	T	cult	O
Arecaceae	*Oncosperma tigillarium* (Jack) Ridl.	Q	6678	st	MF, VF	T	ind	F
Arecaceae	*Ptychosperma macarthurii* (Wendl.) Nichols.		6840	fr	An	T	cult	F
Arecaceae	*Rhapis excelsa* (Thunb.)Henry		6833	st	An	S	cult	F
Arecaceae	*Rhapis multifida* Burret		o.r.		An	S	cult	O
Commelinaceae	*Tradescantia spathacea* Swartz		o.r.		An	H	cult	R
Cyperaceae	*Cyperus radians* Nees & Meyen		6876	fert	Co	H	ind	O
Cyperaceae	*Cyperus rotundus* L.		6844, 6850	fert	An	H	nat?	C
Cyperaceae	*Fimbristylis cymosa* R.Br.		6822	fert	Co	H	ind	F
Cyperaceae	*Kyllinga nemoralis* (J.R. Forst. & G. Forst.) Dandy ex Hutch. & Dalziel		6893	fert	An	H	nat?	F
Cyperaceae	*Mapania palustris* (Hassk. ex Steud.) Fern.-Vill. var. *palustris*		6800	st	VF	H	ind	R
Cyperaceae	*Remirea maritima* Aubl.		6878	st	Co	H	ind	O
Cyperaceae	*Scleria lithosperma* (L.) Sw.		6673, 6869	fr	MF, CF, DF	H	ind	F
Cyperaceae	*Scleria oblata* S.T. Blake		6602, 6862	fert	VF, MF	H	ind?	F
Cyperaceae	*Scleria sumatrensis* Retz.		6688	fl, fr	CS	H	ind	F
Dioscoreaceae	*Tacca palmata* Blume		6606, 6667	fl, fr	MF, CF	H	ind	C
Dioscoreaceae	*Tacca pinnatifida* J.R. Forst. & G. Forst.		6787	fr	CF	H	ind?	R
Flagellariaceae	*Flagellaria indica* L.		6698	st	VF	L	ind	F
Heliconiaceae	*Heliconia psittacorum* Lf.		o.r.		An	H	cult	R
Heliconiaceae	*Heliconia rostrata* Ruiz & Pav.		o.r.		An	H	cult	F
Hemerocallidaceae	*Dianella ensifolia* (L.) DC.	C	6598, 6718	fl, fr	DF	H	ind	F
Iridaceae	*Trimezia martinicensis* (Jacq.) Herb.		o.r.		An	H	cult	R
Marantaceae	*Donax grandis* (Miq.) K. Schum.		6886	st	An	H	ind?	O
Musaceae	*Musa* spp.		o.r.		An	H	cult	F
Orchidaceae	*Aerides odorata* Lour.		6818	st	CR	E	ind	R
Orchidaceae	*Arachnis hookeriana* (Reichb.f.) Rolfe		6826	fl	CR	H	ind	O
Orchidaceae	*Cymbidium finlaysonianum* Lindl.	C	6815	st	CR	H	ind	O
Orchidaceae	*Dendrobium crumenatum* Sw.	C	6817	fl	CR	E	ind	O
Orchidaceae	Orchidaceae sp.1		6816	st	CR	E	ind	O
Pandanaceae	*Pandanus amaryllifolius* Roxb.		6781	st	An	S	cult	F
Pandanaceae	*Pandanus odoratissimus* L.f.	CQ	6760	st	DF, CF	T	ind	F
Pandanaceae	*Pandanus sandens* Holt.		o.r.		An	T	cult	R
Pandanaceae	*Pandanus tetrodon* Ridl.		6703	st	MF	S	ind	F
Poaceae	*Bambusa* sp.1		6834	st	An	S	cult	C
Poaceae	*Centotheca lappacea* (L.) Desv.		6691	fl	VF	H	ind	O
Poaceae	*Chrysopogon zizanioides* (Linnaeus) Roberty		6898	fert	An	H	cult	F
Poaceae	*Cymbopogon citratus* (DC.)Stapf		o.r.		An	H	cult	O
Poaceae	*Dactyloctenium aegyptium* (L.) Willd.		6779	fert	An	H	ind	C
Poaceae	*Digitaria longiflora* (Retz.) Pers.		6772	fert	An	H	ind?	F
Poaceae	*Eleusine indica* (L.) Gaertn.		6771	fl, fr	An	H	ind?	C
Poaceae	*Eragrostis amabilis* (L.) Hook. & Arn.		6788	fl	An	H	nat	F
Poaceae	*Eulalia ridleyi* (Hack.) A. Camus	C	6882	st	Co	H	end	O
Poaceae	*Imperata cylindrica* (L.) Beauv.	Q	6687	fl	CS	H	ind?	C
Poaceae	*Ischaemum muticum* L.	C	6684, 6874, 6879	fl	CS, Co	H	ind	F
Poaceae	*Lepturus repens* (G.Forst) R.Br.		6877	fert	Co	H	ind	O
Poaceae	*Paspalum vaginatum* Sw.		6875	fl	Co	H	ind	O
Poaceae	*Saccharum officinarum* L.		o.r.		An	H	cult	O
Poaceae	*Schizachyrium brevifolium* (Sw.) Nees ex Büse	C			Co	H	ind	
Poaceae	*Spinifex littoreus* (Burm.f.) Merr.	C			Co	H	ind	
Poaceae	*Zoysia matrella* (L.) Merr.		6853	fl	An	H	ind	F
Ruscaceae	*Dracaena elliptica* Thunb.		6613	st	MF	S	ind	F
Ruscaceae	*Dracaena maingayi* Hook.f.		6707	st	MF, CF	S	end	F
Stemonaceae	*Stemona curtisii* Hook.f.		6728	st	VF	C	ind	F
Zingiberaceae	*Etlingera elatior* (Jack) R.M.Sm.		o.r.		An	H	cult	R

Continued

Table 3. *Continued.*

(C) Gymnosperms

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Cycadaceae	*Cycas edentata* de Laub.	CQ	6821	fr	CR	T	ind	F
Gnetaceae	*Gnetum gnemon* L. var. *gnemon*		6643, 6724	fl	MF	T	ind	C
Gnetaceae	*Gnetum latifolium* Blume var. *funiculare* (Blume) Markgr.		6766	st	MF	L	ind	O
Podocarpaceae	*Podocarpus polystachyus* R.Br. ex Endl.	Q	6596	fr	DF, CR	T	ind	C

(D) Ferns and Lycophytes

Family	Species name	PR	Specimen no.	Compo	Hab.-Type	TB	Orig	Rarity
Aspleniaceae	*Asplenium nidus* L.		6741	fert	CF, VF, An	E	ind	F
Blechnaceae	*Blechnum finlaysonianum* Hook. & Grev.		6729	fert	An, Pi	H	ind	F
Blechnaceae	*Stenochlaena palustris* (Burm.) Bedd.		6789	st	CS, VF	C	ind	F
Davalliaceae	*Davallia denticulata* (Burm.f.) Mett. ex Kuhn var. *denticulata*		6740	fert	DF, CR	E	ind	F
Dennstaedtiaceae	*Pteridium caudatum* (L.) Maxon subsp. *yarrabense* (Domin) Parris		6674	fert	Pi	H	ind	R
Gleicheniaceae	*Dicranopteris linearis* (Burm.f.) Underw.	Q	6830	fert	Pi	H	ind	F
Lindsaeaceae	*Lindsaea ensifolia* Sw.		6671	fert	VF	H	ind	F
Lycopodiaceae	*Lycopodiella cernua* (L.) Pic.Serm.	Q	6798	fert	CS, Pi	H	ind	O
Lygodiaceae	*Lygodium flexuosum* (L.) Sw.		6659, 6753	fert	An, Pi	C	ind	F
Lygodiaceae	*Lygodium microphyllum* (Cav.) R.Br.		6689	fert	Pi, CS	C	ind	F
Nephrolepidaceae	*Nephrolepis acutifolia* (Desv.) Christ		6721	fert	CR	E	ind	R
Nephrolepidaceae	*Nephrolepis biserrata* (Sw.) Schott		6657	fert	Co, An	H	ind	F
Nephrolepidaceae	*Nephrolepis cordifolia* (L.) C.Presl var. cordifolia		6754	st	An	H	nat	R
Polypodiaceae	*Drynaria quercifolia* (L.) J.Sm.		6743	st	DF, CR	E	ind	R
Polypodiaceae	*Phymatodes scolopendria* (Burm.) Ching		6742	st	CF, CR	H	ind	O
Polypodiaceae	*Platycerium bifurcatum* (Cav.) C.Chr.		o.r.		An	E	cult	F
Polypodiaceae	*Pyrrosia lanceolata* (L.) Farw.		6720	fert	CR, Pi	E	ind	F
Polypodiaceae	*Pyrrosia piloselloides* (L.) M.G. Price		6676, 6738	fert	MF	E	ind	O
Pteridaceae	*Acrostichum aureum* L.		o.r.		Co	H	ind	R
Pteridaceae	*Adiantum latifolium* Lam.		6665	fert	CF, CR	H	nat	R
Pteridaceae	*Adiantum stenochlamys* Baker		6722	fert	CF, CR	H	ind	O
Pteridaceae	*Pityrogramma calomelanos* (Linn.) Link		6782	fert	An	H	nat	O
Pteridaceae	*Pteris ensiformis* Burm.f.		6664	fert	An	H	nat	R
Pteridaceae	*Pteris tripartita* Sw.		6901	fert	An	H	ind?	R
Pteridaceae	*Pteris vittata* Linn.		6832	fert	An	H	nat	R
Pteridaceae	*Taenitis blechnoides* (Willd.) Sw.		6693	fert	VF	H	ind	F
Schizaeaceae	*Actinostachys digitata* (L.) Wall. ex Reed		6672	fert	DF, CR	H	ind	R
Schizaeaceae	*Schizaea dichotoma* (L.) Sm.		6819	fert	CR	H	ind	R
Thelypteridaceae	*Cyclosorus dentatus* (Forssk.) Ching		6666	fert	An, Pi	H	ind	F
Thelypteridaceae	*Pronephrium asperum* (Presl) Holtt.		6680, 6694	fert	VF	H	ind	O